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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/652,841	08/31/2000	Vishnu K. Agarwal	98-0616.02	4006

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EXAMINER

DIAZ, JOSE R

ART UNIT PAPER NUMBER

2815

DATE MAILED: 01/04/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/652,841

Applicant(s)

AGARWAL, VISHNU K.

Examiner

José R. Díaz

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 October 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 76-90 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 76-90 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

➤ The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

➤ Claims 1-3 and 76-90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Specification in view of Agarwal et al. (US Pat. No. 6,201,276 B1).

Regarding claims 1-3, 76, 79, 81, 83-84, 86-87 and 89, Applicant acknowledges that is well known in the art to form a device (see Figures 1-3 and 6-8) comprising a first plate (24), a dielectric (26) and a second plate (32) comprised of a first conductive of tungsten nitride (28) and a second conductive of polysilicon (30) (see Figure 2). In addition, Applicant acknowledges that it is well known in the art to deposit a plug (46) (see Figures 7-8) and to expose the second conductive to a thermal process (see Figures 2-3 and 7-8, page 6, lines 4-12 and page 11, lines 1-9 of Applicant's Specification). However, Applicant fails to disclose passivating the tungsten nitride. Agarwal et al. teach a well-known method wherein the tungsten nitride is annealed in a reactive atmosphere (e.g. H_2/N_2) to form a protective barrier (see col. 4, lines 40-67, col. 5, lines 64-67 and col. 6, lines 1-10). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Applicant's Specification to include the step of passivating the tungsten nitride in a

reactive atmosphere (e.g. H_2/N_2). The ordinary artisan would have been motivated to modify Applicant's Specification in the manner described above for at least the purpose of reducing the current leakage in the capacitor. In addition, Applicant fails to disclose exposing the tungsten nitride to oxygen. Agarwal et al. teach that it is well known in the art to anneal the tungsten nitride in an oxidizing environment (see col. 5, lines 43-51, col. 6, lines 15-20 and 43-50, and col. 7, lines 4-8 and 25-47). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Applicant's Specification to include the step of annealing the tungsten nitride in an oxidizing environment. The ordinary artisan would have been motivated to modify Applicant's Specification in the manner described above for at least the purpose of forming a saturated layer, which does not show any transient diffusion processes.

Regarding claims 77, 82 and 85, Applicant acknowledges that the dielectric comprises tantalum pentoxide (see col. 4, lines 28-37).

Regarding claim 78, Applicant acknowledges that it is well known in the art to use other well-known gases as the reducing atmosphere (see col. 4, lines 47-62).

Regarding claim 80, Official Notice is taken with respect to the limitation regarding the thickness of the oxide layer since it is well known in the art that treating the tungsten nitride in an reducing atmosphere such as H_2/N_2 would reduce the thickness of any oxide formed over the tungsten nitride. Furthermore, it would have been obvious to one of ordinary skill in the art to reduce the thickness of the oxide layer to less than 10 angstroms, since it has been held that where the general conditions of a

claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claim 88, Applicant acknowledges that the plug (46) comprises polysilicon (see page 10, lines 10-22 and Figure 7).

Regarding claim 90, Applicant acknowledges that the second conductive layer (48) comprises copper (see page 10, lines 19-20).

Response to Arguments

➤ Applicant's arguments with respect to claims 1-3 and 76-90 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

➤ The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Narwankar et al. (US Patent No. 6,204, 203 B1) disclose post deposition treatment of dielectric films for interface control. Lu et al. (US Patent No. 5,913,145) disclose passivating a tungsten nitride layer (see Figures 1A-1E).

➤ Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within

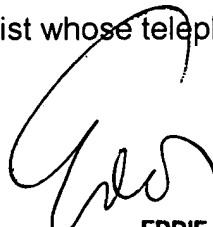
TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R. Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 8:00 - 5:00 Monday through Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

JRD
December 27, 2001